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GaN Schottky Barriers Probed by BEEM Spectroscopy and Imaging*

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Among the challenges involved in the utilization of GaN and related nitrides in devices is an understanding and characterization of Schottky contacts to these materials. Varying values of Schottky barrier height have been reported, using conventional interface probes such as *I-* V and C-V which yield spatially averaged values of barrier height. This variation likely indicates the effects of heterogeneity of interface properties, Ballistic-electron-emission microscopy (BEEM) is a recently developed method, based on scanning tunneling microscopy, for probing interfaces with nanometer resolution. A strong advantage of BEEM for the characterization of interfaces is the capability to isolate individual nanometer-scale areas for analysis, probing both local Schottky barrier height and its spatial variation, In addition, other properties affecting hot-carrier transport across an interface maybe probed, such as the effects of higher conduction-band minima in the semiconductor. In the presence of interface heterogeneity due to defects, the high spatial resolution of BEEM is required to address the problem, BEEM measurements have been performed on Au/GaN and Pd/GaN. An average Au/GaN Schottky barrier height of 1.1 eV has been measured by BEEM spectroscopy, compared with a value measured by *I-V* (on the same samples) of- 0.8- 1.0 eV. The large variation in barrier heights measured by *I-V* is an indication of interface or bulk heterogeneity. A more direct measure of heterogeneity is provided by BEEM imaging of this interface; images show electron transmission in most areas, but the intensity of transmission varies strongly. Characterization of some GaN material reveals no measurable BEEM hot-electron transmission, although high-quality, low-leakage Schottky barriers can still be formed. The various possibilities for this result will be explored.

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